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THE DROUGHT OF SEPTEMBER, 1907.

The long-deferred spell of genuine summer weather which came in September, following a dismal succession of cold and gloomy months, has elicited a chorus of praise in the daily press, and we conclude that the absence of rain was viewed with no little satisfaction both by the agriculturalist and the pleasure-seeker. Crops in many places, after causing no little anxiety, ripened with great rapidity, and in Scotland we believe that what promised to be a late harvest was converted into an unusually early one.

Under the influence of settled anti-cyclonic conditions, the prevailing weather in different parts of the British Isles was of a remarkably uniform type, and, broadly speaking, it was only in Scotland and the south of Ireland that any rain of consequence fell after the 6th day of the month. The absolute drought resulting was therefore unusually prolonged, especially taking into account the wide area over which it was spread. On the average of about twenty years, the longest drought of the year at any one station in the British Isles is 25 days, whereas in the present instance not one station only but large tracts of the country were entirely without rain for this period. The accompanying map shows by the unshaded area on the land those parts where a technical "absolute drought" occurred, *i.e.*, a period of more than 14 consecutive days with no rain recorded. In parts of the north-west of England a period of 25 or 26 days was cut in half by an entry of ·01 in of "rain" occurring midway, and this was sometimes the result of fog-condensation, itself an indication of the continuance of unbroken anticyclonic influence. The map thus shows less rather than more of the drought which took place. However, it brings out well the absence of absolute drought over the greater part of Scotland and Ireland, which are shaded, and throws into contrast the large area, including practically the whole of Wales, the west Midlands and the Wessex region within the dotted line, over which from 20 to 25 consecutive days passed without measurable rain. It is rather striking that the drought was best established over the normally wettest districts of the Welsh uplands. In the eastern half of England a little rain on or about the 25th curtailed the period to about 18 days, after which it was dry again.

The amount of rain during the whole of September was unusually small over the whole country, and it is a rare occurrence in any month for so considerable a proportion of the British Isles to receive less than an inch. The most noticeable feature was the extraordinary uniformity of the fall over England and Wales, where it scarcely differed from ·60 in. to ·70 in. at any stations except in the hills of Cumberland and Wales and in the Cornish peninsula. A narrow strip on the east coast of England, including Northumberland, had less than half an inch.

ON SOME OF THE CAUSES AND EFFECTS OF ATMOSPHERIC ELECTRICITY.

By L. C. W. Bonacina.

When in the eighteenth century Franklin, together with Dalibard and Richmann, experimentally demonstrated beyond doubt that lightning was an electric discharge, he laid the foundations of the science of atmospheric electricity, the phenomena of which, though they have in more recent times formed the subject matter of a large number of theories, are still very imperfectly understood with regard to their causes and effects. Franklin's views upon electrical science in general may appear somewhat crude to those who are acquainted with the abstruse conceptions of modern physics upon such matters, just as does, for instance, the theory of light of the great Newton, the archetype of the natural philosopher; but, as regards this subject of atmospheric electricity, it may be said that the knowledge of solid facts such as that established by Franklin is sorely needed if the application to the problems of the atmosphere of advanced physical theory is to be productive of fruitful results.

To account for the origin of the electricity of our atmosphere, various natural operations conducted on an extensive scale upon the Earth's surface—such as the physical processes involved in evaporation, or the chemical processes in vegetation, animation and organic decomposition—have been invoked; but hitherto it has been generally considered that the only known agent adequate to explain the observed electrification of the air is friction—the friction of bodies against one another through the instrumentality of wind.

The discovery of "ionization" of the atmospheric gases, however, akin to that of salts in solution, has indicated further very probable sources of electricity. In order to gain a clearer understanding of the nature of ionization, let us refer to the phenomena of the Crookes' vacuum tube, together with those connected with the property of radio-activity which is possessed in so marked a degree by the recently discovered element radium. In the first place, what is radio-activity? and what grounds are there for believing it to constitute a factor in electrifying the air? It would be impossible to answer these questions adequately within the limits of a meteorological article, but it may be well to explain the essential idea of the theory of radio-activity in the interests of the present subject. Firstly, it is necessary to distinguish between two kinds of radiation which may be emitted from bodies—namely, the ordinary radiation and radio-activity.

By the ordinary radiation we mean the energy which is transmitted through, or rather by means of, the ether by a body in virtue of the energy possessed by the body in the form of heat or molecular motion. Any body, then, whatever its temperature may be, short of absolute zero, is always emitting and absorbing radiant energy, whether it rises or falls in temperature depending upon the balance

between loss and gain. This species of radiant energy consists, as is well known, of vibrations in the ether, the wave-lengths increasing from the ultra-violet actinic rays to the infra-red or dark "heat" rays, or, further still, to the very long "electric" waves of Hertz. How much of the spectrum is represented in the radiation from any particular body at any time depends upon its chemical and physical constitution as well as upon its temperature, and is a purely physical question. The important thing to note is that the heat energy of the body—the vibratory or kinetic energy of its molecules—is transmitted across the ether in what Maxwell believed to be electro-magnetic waves, and that the communication of energy from molecules to ether is effected in a special manner which it would here be irrelevant to discuss in accordance with the present electronic view of matter.[1]

We shall now be able to obtain a clearer conception of what is meant by radio-activity, or the "extraordinary" form of the radiation of energy. A body like radium which exhibits the phenomenon of radio-activity is conceived to be in a state of atomic rupture or disentegration, its atoms undergoing decomposition into lighter ones. This phenomenon is conspicuous in certain chemical elements which have very heavy atoms, or, in the language of chemistry, are of high atomic weight, and the atomic explosion, as we might call it, which is made manifest by it naturally gives rise to molecular or thermal disturbances within a radio-active body, thus producing the ordinary kind of radiation as well.

From the cathode of a Crookes' vacuum tube connected with an induction coil something of a very interesting nature is shot off. These cathode rays were designated by Crookes about thirty years ago as matter in a "fourth state," and for a long time their nature remained most puzzling to physicists. Without entering into details as to the various properties of the cathode rays, it may be said at once that they consist of inconceivably minute particles torn away from the cathode, and each of these particles is called an "electron."

Professor J. J. Thomson, of the Cavendish Laboratory, Cambridge, upon the basis of an extensive and brilliant series of experiments a few years ago, calculated the mass of an electron to be about $\frac{1}{700}$th of that of the lightest known atom of matter, namely, hydrogen, and its velocity in the vacuum tube about $\frac{1}{10}$th that of light, or 18,000 to 19,000 miles a second. Now, particles essentially identical with electrons are emitted from radium and other radio-active bodies. In accordance with the electric theory of matter, which rests upon a high degree of probability, but cannot yet be conclusively proved, we may regard the electron as an atom of negative electricity or as the unit electric charge; and an atom of matter as a structure, the dynamics of which is at present the subject of much discussion, composed of a number of these negative charges or electrons in

[1] See, for instance, Sir Oliver Lodge, *Phil. Trans.*, 1893, Vol. **184**, p. 750.

association with positive charges. Thus is matter expressed in terms of electricity.

This is truly a magnificent doctrine ;[2] but I have here endeavoured to outline it in the fewest words possible. The bearing of these theoretical questions upon the subject in hand will now be apparent. For the sun is an intensely radio-active body, and the radiator not only of the electro-magnetic waves which constitute light and dark "heat" rays, convertible more or less into heat upon striking matter, but also of electrons which probably after electrifying the upper air cause an accumulation of negative electricity on the Earth's surface, and, constituting electric currents of moderate strength, originate magnetic storms and auroral displays. When they enter the Earth's atmosphere these electrons partially "ionize" the molecules of the atmospheric gases, that is to say, decompose them into their constituent atoms, which, being oppositely charged, form positive and negative "ions" (anions and kations), much in the same way as the molecules of, say, chloride of sodium, or sulphate of copper when dissolved in water, undergo partial decomposition (by the mere process of solution) into the charged bodies or ions,

$$\overset{+}{\mathrm{Na}},\ \overset{-}{\mathrm{Cl}} \text{ and } \overset{+}{\mathrm{Cu}},\ \overset{-}{\mathrm{SO_4}}$$

respectively which can be separated by passing an electric current through the solution. Another potent source[3] of electrons causing ionization of the upper air is believed to be the action of ultra-violet light upon the ice or snow particles of high-level cirrus clouds, and the causes of ionization in the atmosphere are thought to be numerous.

There are then at least two general sources of atmospheric electricity, (1) mechanical friction ; (2) ionization.

It is now expedient to inquire into the effects of the electrification of the atmosphere or the meteorological phenomena due to its existence. The subject may be conveniently divided into : (*a*) the influence of electricity upon the condensation of aqueous vapour, (*b*) the manifestation of electricity in thunderstorms and in auroral displays, magnetic storms and kindred phenoma, (*c*) thermo-dynamic effects. Owing to the limitation of space I shall, in this article, only be able to dwell upon the first division.

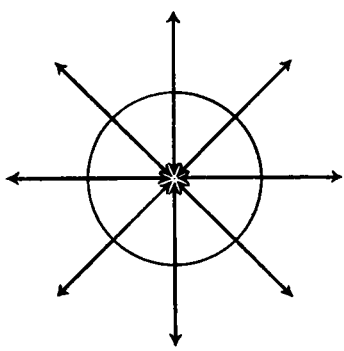
It has hitherto been supposed that in air deprived of dust aqueous vapour will not condense when the temperature of saturation is reached. Aitken showed that for condensation to take place nuclei must be present to serve as points of attachment to drops of water.

[2] For a clear exposition of this theory, Sir Oliver Lodge's excellent book on "Electrons" may be consulted. (London : George Bell & Sons, 1906.)

[3] It has recently been argued on mathematical grounds that electrons must be limited in their approach to a magnetized body like the Earth to the region near the magnetic poles. (See *Nature* for September 5th, 1907, p. 481.) However this may be it is not supposed, as indicated above in the text, that the atmosphere in general depends for ionization upon the discharge of solar electrons alone.

The required nuclei have been supposed to be supplied by the impalpable dust consisting of diverse materials generally present in the air even at high levels. No one doubts but that dust plays an important part; but, inasmuch as the quantity of dust decreases very rapidly upwards, one cannot positively assert without direct evidence that it is always sufficient to minister to the wants of every mass of saturated vapour. It is known, however, to physicists that "ions" can also serve as condensation nuclei, and it is consequently inferred that the ions of the atmosphere give rise to the condensation of moisture. This brings us at once to the consideration of the theory of condensation nuclei in general, whether they be dust particles or ions. In the first place Lord Kelvin has shown that an infinitesimal globule of liquid cannot exist, it must immediately vapourize. If, however, such a globule can attach itself to a surface of finite curvature, such as that afforded by a dust particle, then it will pass into a stable liquid condition if its temperature is below the vapour-saturation point.

Ions, it will be remembered, are *atoms bearing a charge of electricity*; those present in the atmosphere will, therefore, generally be charged atoms of oxygen or nitrogen. Although a minute globule of water possessing an infinitely convex surface cannot exist in the ordinary condition it can do so if in the electrified condition. The reason of this is explained mathematically by physicists.[4] A drop of water by reason of the curvature of its surface experiences a radial-component of surface tension directed inwards, and therefore an increased internal pressure; whereas, in virtue of its surface electrification, it is subjected to an electric tension directed outwards. These two antagonistic forces operating upon the globule of water, I represent in the annexed diagram. The circle represents a plane section of the spherical water droplet; the interior arrows show the direction of the radial-pressure component of the surface tension, and the exterior that of the electric tension due to the uniform surface charge. There is a certain critical size at which the ionic charge (*vide ut supra*) will balance, so far as condensation is concerned, the surface tension, so that the convex electrified droplet will act as though it were unelectrified and flat, that is to say, it will be able to have a stable liquid existence. The critical size is of the order 10^{-21} c.c. ($\frac{1}{1,000,000,000,000,000,000,000}$ cubic centimeter); in other words, it is of atomic dimensions. Hence, it is inferred that an ion



[4] J. J. Thomson, "Applications of Dynamics to Physics and Chemistry." Lodge, "Electrons," p. 81.

(atom + electron) can play the part of a condensation nucleus. It thus appears that electricity may act as the initial impulse required to condense vapour when it is saturated. But it is further extremely probable that the small electrified drops so formed in the first stage of condensation are caused to coalesce in virtue of the charges upon them, and thus to continue the process. It was, indeed, experimentally determined by Lord Rayleigh[5] in 1879 that drops of water which are slightly and similarly electrified (the similar electric charges upon the drops not being strong enough to effect electrostatic repulsion) have a pronounced tendency to coalesce. I would here provisionally suggest that we have here at least a partial explanation of the characteristic difference between the cyclonic rain of winter and the thunder rain of summer. There is, of course, no line of demarcation between the two types of precipitation, but the extreme form of each is very distinct. The large drops and usually great concentration of the thunder rain are likely to result from the coalescence of cloud droplets produced in the first stage of condensation; droplets possessing a charge sufficient to effect such coalescence, but not sufficient supposing all the charges to be of like sign to engender mutual repulsion. In the case of the cyclonic rain, on the other hand, one may suppose the aggregation of small drops to form rain drops to be brought about mainly by mechanical or other means, the individual electric charges on the smaller drops being so insignificant that they cannot promote their growth, or at all events not to the same extent as in the thunder rain. It appears, therefore, that although the electric manifestations of thunderstorms certainly proceed from the condensation of vaporous masses involving the greatly increased concentration of electricity necessary for the occurrence of disruptive discharges, the condensation itself may partly result in two distinct ways from the operation of electricity in the atmosphere; so that whether it is correct to call condensation a cause or an effect of electrification depends very much on the terms of our electricity. I will not in this essay touch upon the electrostatic induction theory of thunderstorms as that is well known, so far indeed as it is applicable to the scanty and inadequate observations which we are able to make upon them.

[5] *Proceedings* of Royal Society, 1879, Vol. **13**, p. 406. "The Influence of Electricity on colliding Water Drops." From this article I quote the two following passages (the experiments were made with water-jets):—

"Instead of rebounding after collision as the unelectrified drops of clear water generally or always do, the electrified drops coalesce, and thus the jet is no longer scattered about. When the electrical influence is more powerful the repulsion between the drops is sufficient to prevent actual contact, and then, of course, there is no opportunity for amalgamation."

" . . . . . Now from what has appeared above we have every reason to suppose that the results of an encounter will be different according as the electrified condition of the particles, and we may thus anticipate an explanation of the remarkable but hitherto mysterious connection between rain and electrical manifestations."

The phenomenon of the aurora associated with those of sun-spots, magnetic storms, etc., has long been shrouded in mystery. The theory latterly proposed by Arrhenius, though in nowise proved, has at least the merit of being simple, definite and also very beautiful. The Earth's magnetic lines of force are thought to guide the electrons received from the sun in spiral courses away from the tropical regions towards the magnetic poles, where in the rarefied upper air there occur on a magnificent scale the phenomena of the vacuum tube. Hence the surpassing glory of the long winter nights.

The other remaining important effects of atmospheric electricity are difficult and complicated subjects, and their discussion must be left over for a future paper.

These effects[6] are concerned with the influence of ionization upon temperature in the several strata of the atmosphere and hence upon the diurnal variations of the barometric pressure, the gradient of electric potential and other periodic changes.

AERIAL NAVIGATION.

THE autumn of 1907 will be remembered as the time when the possibilities of navigating the air were finally proved beyond question. In France, in Germany, and in England, notable flights have been made by the military air-ships, in the perfecting of which all the great powers have been keenly interested for some years. The longest flight, and the greatest time in the air, appears so far as we can judge from the newspaper reports, to have been attained by Count Zeppelin's great air ship on the Lake of Constance; but none of the recorded efforts seem to have been more satisfactory than those of the British military air-ship at Aldershot. Colonel Capper and Mr. S. F. Cody had already made several preliminary flights at Aldershot, proving that the great sausage-shaped gas-bag which gave bouyancy to the platform carrying the motor and propellor could be controlled in its movements, both horizontally and vertically with perfect ease; ~~but on~~ Saturday, October 5th, they steered the *Nulli Secundus* from Aldershot to London, circled round St. Paul's, performed various evolutions over the Horse Guards, and, the wind having become too strong to permit of a return to Aldershot, they steered the aerial craft to the Crystal Palace, and descended gently in the midst of the enclosed cycle track. The success of aerial navigation must of necessity stimulate the study of meteorology, and it promises to open a new and fascinating area for meteorological research.

[6] "Studies on the Diurnal Periods in the Lower Strata of the Atmosphere." By F. H. Bigelow, U.S. Department of Agriculture, Washington, 1906.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE DROUGHT OF SEPTEMBER, 1907, AT CLIFTON.

THE absolute drought of 25 days in this month, from the 6th to the 30th, was the longest experienced in 52 years, with the exception of one of 26 days, from February to March 1st, in 1897. This month was also the driest September in the above period, with the exception of September, 1865, when only ·05 of an inch of rain was measured.

It is noteworthy that we have now had four dry Septembers in succession, viz.:—1904, 1·54 in.; 1905, 1·33 in.; 1906, ·82 in. and 1907, ·62 in. The average for 34 years is 3·03 in.

ROBT. F. STURGE, F.R.Met.Soc.

101, Pembroke Road, Clifton, 5th October, 1907.

SEPTEMBER'S SUMMER.

SEPTEMBER fully upheld its title to be considered a real summer month in 1907, for it provided beautiful harvesting weather of sunshine and drought between the 6th and end of the month. It is true the temperature was not nearly so high as it was in 1895 and 1865, but the fine, dry period came at the end of a very disappointing season this year, and brought some recompence for the ungenial atmosphere prevailing in June, July and August. Looking back to old records it is perhaps a little curious that we had very hot Septembers in 1795, 1805, 1815, 1825, 1865, 1875, 1895, and that the month was very cold in 1820, 1830, 1840, 1850, 1860 and 1870; but 1810, 1880 and 1890 were extremely warm, while 1845 and 1885 proved cold, so that the sequency in decades is by no means regular. Yet it is sometimes interesting to point out any approach to cyclical variations in weather characteristics, for though they are usually the result of obvious coincidences, they nevertheless have a very suggestive and significant look about them.

Our recent experience will prompt us to assent to Orlando Whistlecraft's description of September, when he says, "This month when fine is one of the most delightful in the year for walking, riding, or driving, as the calm serenity, with the peculiarly beautiful clouds, and agreeable softness of temperature, yield the most pleasing sensations."—*Climate of England*, p. 11. W. F. DENNING.

Bishopston, Bristol, September 30th, 1907.

THE SUNSHINE RECORDER.

ALLOW me to express my appreciation of the article "Distribution of Bright Sunshine over the British Isles," given in the September number of your Magazine.

Mr. Curtis has given us some very useful and important information, and the table of hours duration in different latitudes will prove

of very practical use. We learn that the Campbell-Stokes recorder is accepted as the officially recognized instrument. But yet I believe that observers often find difficulty in giving a *faithful* result of the daily records; the discoloration is frequently so faint, or terminates in so sharp a point that the time of beginning and ending is almost impossible of correct estimation.

Now, very recently, I have observed when the sun has declined, say below 15 degrees of the horizon, with no clouds, that for nearly an hour there has been a clear bright spot running on the card, but no apparent mark left for determining the exact time. I do not know whether photography would reveal an impression. Can the card be made more sensitive—is it possible to bring in the aid of chemistry to perfect a contrivance which seems, in all other respects, to be the best sunshine recorder yet devised?

Deal, 30th September, 1907. TURNOR PEEL.

WANTED! A NAME.

Could not a more convenient and appropriate name be found for the branch of science dealt with in your pages? "Meteorology" is awkward enough; "Meteorological" is worse, and might serve as a test for sobriety; and what Englishman will tackle that jaw-breaker, the *Meteorologische Zeitschrift*?

Meteorology is the science of meteors; but we have restricted the sense of that word. Again, it is the science of "things lifted up," of things above the earth; a primitive conception which might seem to include birds, &c. Formerly it included the heavenly bodies, and to-day it takes cognizance of the sun, prime cause of weather; also, at times, of the moon. These are both "up" and "down," or neither. Once more, we record underground temperature.

Why not "aerology"; though this has been lately proposed for a special line of inquiry! It might be interesting to have suggestions on the subject. A. B. M.

Gudebridge, Crouch End, September 10th, 1907.

THE SPECTRE OF THE BROCKEN.

Last Friday, 20th September, I saw this phenomena very clearly from the cliffs here. There was a dense fog seaward and brilliant sunshine on the hill. A friend and I were walking near the East Cliff when we remarked the shadows of our figures thrown on the fog—the cliff is from 150 to 200 ft. high, and the lower part of the fog was in deep shadow—our figures appeared, as it were, walking on the top of the shadow. A halo, or corona appeared over our heads. Further on along the cliffs, whenever our shadows were thrown on the fog, the same phenomenon was repeated.

H. A. COSGRAVE.

Howth, Co. Dublin, September 27th, 1907.

A RARE CLOUD-FORM.

FOR the first time I witnessed the so-called Pocky or Pocket Cloud at Hampton Court, on August 15th, 1907, between 3.30 and 4 p.m. It consisted of about a score of seemingly huge black balls, well formed, touching each other, the upper part evidently extended cloud, as no blue sky could be seen in the interspaces. They sagged somewhat before passing into dense cumulus very slowly, no rain falling. These balls occupied a large space about the zenith, though not central there. They may have been apparent long before I noticed them; seemed stationary, and lost the globular formation with a scarcely perceptible motion, the air being nearly calm.

Believing this cloud to be very rare is my excuse for sending this note. Being my first interview, attention was fixed upon the Pocket, and I now find I should have estimated angles, etc.

R. STRACHAN.

61, Offord Road, N., 10th October, 1907.

THE STUDY OF WEATHER PHENOMENA.*

By Rev. D. C. BATES, F.R.G.S., F.R.Met.Soc.

NATURE-STUDY has only of recent years been recognised as a branch of education, or as a proper means of training the mind, and of equipping it with useful knowledge for the battle of life. Formerly, primary school teachers were almost entirely limited to drilling their scholars in the three "R's,"—reading, writing and arithmetic. Work was little less monotonous in the secondary schools, because the universities which set the standard for them so fostered the study of the classics and higher mathematics that those who sought degrees had ruthlessly to confine their studies to dead languages, or intricacies of calculation, so that even modern literature and languages (to say nothing of science) were neglected. Under those conditions real education had almost to commence when the doors of the school or college closed behind the students. But now even the oldest and most conservative universities have undertaken to teach and grant degrees in literature, science and art. In this way many of the best European and American universities now have regular or special courses in meteorology.

The weather is studied especially in the secondary schools of the United States of America, and a large proportion of the primary schools of that progressive country adopts it as an important branch of work.

The study of weather phenomena may be used as a means for training children in intelligent observation and accuracy, attention and patience; the memory is cultivated by practical illustrations

* A paper read to a gathering of teachers at the Training College, Wellington, N.Z., August 1st, 1907.

and associations, not only of the weather phenomena with each other, but with their actual results, and in this respect the reasoning faculties are exercised in the study of cause and effect. Lastly, such knowledge is often obtained that the person so trained develops capabilities for the forecast of local weather. It must not, however, be expected that all who study weather will become "weather-wise," or learned in coming changes, yet if once the art of forecast be acquired in any degree, it cannot possibly be neglected or grow rusty for want of use in any temperate region of the Earth, such as this in which it is our happy lot to find ourselves, though even here some who really ought to know better do little else but grumble at the weather.

Thus it is that phenomena which are hardly observed cannot be remembered, associated with other examples and used as an experience in life. "One eye in all Verona saw the beauty of that sky," could often be repeated of many a crowded city, where men hardly know which way the wind blows.

At sea and in the country it is different, for there the weather is the dominant topic of conversation, and all business and pleasure directly depend upon it. Consciously or unconsciously everybody there studies it more or less, but to get the best results even in the study of weather the mind needs direction and training. Country teachers have in their scholars wonderful opportunities for good work, which are not always recognized and appreciated at their full due. An American writer indicates these when speaking of larger issues he wrote :—"The country boy is often more successful than the city bred boy, partly because he has developed habits of personal observation and experience ; because he has had natural and not artificial things around him. He sees nature in a large way and is quick to grasp conditions and foresee results."

Meteorology can undoubtedly assist you in your work as a teacher. In its elementary form it has manifold and fundamental relationships to other branches of learning, such as geology, chemistry, astronomy, biology, and above all geography. We go from the known to the unknown, step by step, line upon line we acquire knowledge, and before we can really be thought to hold it, we must attach our impressions one by one to some fact already in the storehouse of our own knowledge and experience. Meteorology may furnish a valuable link in many a chain of association because a knowledge of climatic conditions often illustrates and explains the phenomena of natural science and human history. Thus practical acquaintance with the seasons in their varying phases of temperature, wind, rainfall, &c., when definite and accurate, may be used not only as a basis of comparision in estimating climates, but also as the standard by which we gauge results in the products of the Earth and of human activities.

It is not necessary to purchase either an extensive literature or an expensive equipment of instruments, before we commence the study

of weather phenomena. Much that is well worth doing and may be well done is accomplished with only simple methods of study in the book of Nature itself. Those who postpone their studies in meteorology until they can get a supply of expensive instruments, are in thus placing their uncertain hopes in the dim and distant future, really neglecting the root of the matter, and in great danger of having no foundations for the scientific study of weather, should they ever become the possessors of a meteorological observatory. They may become very useful to meteorological science, but not having the root of the matter in them, they frequently only become drudges at statistics. An observant and thoughtful child who may know nothing about barometers, thermometers, anemometers, &c., but who watches the skies, will after all be a better guide to the weather than they, for instrumental knowledge is but a poor substitute for meteorological science. Writing about the study of the clouds John Ruskin once said :—"There is no study open to you in all the expanse of science where so much can be done by dexterous attention and patience, *without the aid of costly instruments*, and in the lovely and healthy laboratory of the air." At another time the same writer described meteorology in the following terms :—"It is a science of the pure air, and the bright heaven ; its thoughts are amidst the loveliness of creation ; it leads the mind, as well as the eye, to the morning mist, and the noonday glory, and the twilight cloud, to the purple peace of the mountain heaven, to the cloudy repose of the green valley ; now expatiating in the silence of stormless ether, now on the rushing wings of the wind. It is indeed a knowledge which must be felt to be, in its very essence, full of the soul of the beautiful. For its interest it is universal ; unabated in every place and in all time. He whose kingdom is the heaven can never meet with an uninteresting space, can never exhaust the phenomena of an hour ; he is in a realm of perpetual change, of eternal motion, of infinite mystery. Light and darkness, cold and heat, are to him as friends of familiar countenance, but of infinite variety of conversation, and while the geologist yearns for the mountain, the botanist for the field, and the mathematician for the study, the meteorologist, like a spirit of higher order than any, rejoices in the kingdoms of the air."

(To be continued.)

REVIEWS.

Second Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury. For the year ended 31st March, 1907. Presented to both Houses of Parliament by command of His Majesty. London, Stationery Office, 1907. Size 9½ × 6. Pp. 150. Price 1s. 7d.

THE Report mentions that Professor W. Somerville has resigned his membership of the Committee and Professor T. H. Middleton, his

successor at the Board of Agriculture, has taken his place. The property of the former Meteorological Council (a limited company which has been wound up in accordance with the provisions of the Companies Acts) has now been vested in the Administrative Secretary of the Treasury and the Director of the Meteorological Office for the time being as Trustees for the Committee.

The Post Office, we are not surprised to learn, has not been induced to take any steps towards facilitating the dispatch of storm warnings by telegraph, nor does it seem to have thought of employing the ever-open offices of the trunk telephone exchanges for this service. So it will continue to happen that telegraph wires will occasionally be blown down before the warning of the avenging storm has been permitted to pass along them.

The Committee throws out the suggestion that a meeting of the Meteorologists of the British Empire might advantageously be held in Canada at the end of May, 1908, and there is no doubt that such a meeting would serve as a stimulus to the various meteorological services.

Various modifications have been made in the weather charts in order to give effect to the larger area from which telegraphic reports are now received, and new methods for preparing forecasts are in course of development.

A great amount of research is in progress under the auspices of the Committee, and it is evident that it takes an entirely different view of the functions of a Government Meteorological Service from that which has generally been held hitherto. This cannot fail to be of great benefit to the science and to the country if complete co-operation can be secured with other meteorological organizations, and if the great influence which the Meteorological Committee can exert is brought to bear on the amelioration of the somewhat hard conditions in which some of those bodies have to work.

Observing and Forecasting the Weather. Meteorology without Instruments. By D. W. HORNER, F.R.Met.Soc. London, Witherby and Co., 1907. Size $7\frac{1}{2} \times 5$. Pp. 48. Price 6d. net.

MR. HORNER is an enthusiastic meteorological observer and his keen interest in the subject gives a heartiness to this booklet which many more pretentious publications do not possess. Limited to non-instrumental observations and written in a style which we may characterize as pleasantly discursive, the little work will, we are sure, suit the tastes of many who are not disposed to tackle the more formal and statistical aspects of a science which in truth deals with matters various enough to appeal in some measure to all.

METEOROLOGICAL NEWS AND NOTES.

DR. H. R. MILL WILL LECTURE on "Rain," in connection with the Gilchrist Educational Trust, at Normanton, on Monday, November 4th; at Cleckheaton, on Tuesday, November 5th; at Great Harwood, on Wednesday, November 6th; at Radcliffe, on Thursday, November 7th; and at Bury, on Friday, November 8th. He hopes to be able to visit rainfall observers in the adjacent parts of Yorkshire and Lancashire during the week of the lectures.

HEAVY RAINS IN SEPTEMBER and the early part of October have produced devastating floods in the south of France and of Spain. Large tracts of country in the Mediterranean departments of France have been inundated, towns have been isolated by the destruction of the connecting roads, railways, telegraphs and telephones, and immense damage has been done to property. Many lives also have been lost. We hope to give fuller particulars in an early number.

THE ALPS AS A WEATHER DIVIDE have attracted some attention on the continent. We may accordingly put on record a recent experience when entering the St. Gothard tunnel on the south side in brilliant sunshine under a cloudless sky, we emerged in thirteen minutes on the north side in a fog so dense that it was difficult to believe we had left the tunnel. The fog diminished as we descended, but the evening was dull and gloomy all the way to Bâle.

MESSRS. PASTORELLI & RAPKIN have forwarded for our inspection their Peandar set of instruments, the somewhat puzzling name representing the initials of the firm. The set is sold at the very moderate price of £6 6s. without, and £7 18s. 6d. with, Kew certificates: the additional cost should be cheerfully incurred by any purchaser as instruments without certificates are not complete for scientific purposes. The set consists of a neat Fortin pattern barometer reading by a vernier to ·01 in., a wet bulb, dry bulb, maximum and minimum thermometer and a standard Snowdon rain gauge. The instruments are well made, the only criticism we have to offer on them being that the barometer should be provided with an attached thermometer, and that some form of screen for the proper exposure of the thermometers must be provided by the observer.

MESSRS. DARTON & CO. have sent us their new illustrated price list of meteorological and other instruments. The instruments, as illustrated, appear to be of good construction and moderate price. Some obsolete patterns of rain gauges appear but prominence is given to the standard patterns, and the list will interest many of our readers.

AN OLD RAINFALL OBSERVER writes to us that the state of his health making it necessary for him to cease observing, he presented his rain gauge to the authorities of a public park in the neighbourhood, hoping that they would set it up and appoint someone to look after it. "They, however," he says, pathetically, "decided to place it in the museum as a curiosity."

TEMPERATURE FOR SEPTEMBER, 1907.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	TEMPERATURE. Max.		TEMPERATURE. Min.		No. of Nights at or below 32° Shade.	No. of Nights at or below 32° Grass.
		° ′	° ′		°	Date.	°	Date.		
Camden Square	*London*	51 32	0 8	111	80·1	25	38·0	23	0	0
Tenterden	*Kent*	51 4	*0 41	190	78·0	13	39·5	24	0	...
West Dean	*Hampshire*	51 3	1 38	137	76·0	12	29·0	23	2	13
Hartley Wintney	,,	51 18	0 53	222	75·0	13, 17	30·0	23	2	4
Hitchin	*Hertfordshire*	51 57	0 17	238	79·0	25	32·0	22	1	...
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	78·0	25	30·0	24	2	3
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	79·8	25	36·0	24	0	2
Brundall	*Norfolk*	52 37	*1 26	66	79·0	25	32·6	23	0	2
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	79·7	9	31·6	23	1	2
Torquay (Cary Green)	*Devon*	50 28	3 32	12	71·8	13	44·2	15	0	0
Polapit Tamar [Launceston]	,,	50 40	4 22	315	75·5	8	34·0	24	0	3
Bath	*Somerset*	51 23	2 21	67	75·0	12	35·2	23	0	0
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	73·0	8	41·0	23	0	...
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	72·0	12	26·0	4	2	...
Coventry Kingswood	*Warwickshire*	52 24	1 30	340	68·0	12	41·0	24	0	...
Boston	*Lincolnshire*	52 58	0 1	25	73·0	25	39·0	24	0	...
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	75·2	12	32·2	24	0	6
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	78·0	28	34·0	22	0	...
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	75·0	25	35·3	4	...	...
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	...	...	...	...	...	...
Arncliffe Vicarage	,, ,,	54 8	2 6	732	...	...	...	...	...	...
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	73·0	12, 13	33·0	4	0	1
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	...	...	...	...	...	...
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	77·2	28	32·9	4	0	...
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	...	...	...	...	...	...
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	71·4	12	38·2	4	0	...
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	79·0	25	29·0	3	...	...
Llandudno	*Carnarvon*	53 20	3 50	72	73·8	9	39·5	4	0	...
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	78·0	28	29·0	4	1	...
Lilliesleaf (Riddell House)	*Roxburgh*	55 31	2 46	550	...	..	...	...	...	...
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	76·3	10	36·7	3	0	0
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	76·0	28	30·0	4	...	...
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	70·0	10	36·0	2	0	5
Tighnabruaich	*Argyll*	55 55	5 14	50	60·0	10†	34·0	2	0	...
Mull (Quinish)	,,	56 36	6 13	35	74·0	9	...	...	...	...
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	76·2	10	33·0	4	0	...
Braemar	*Aberdeen*	57 0	3 24	1114	...	...	...	...	...	...
Aberdeen (Cranford)	,,	57 8	2 7	120	77·0	10, 19	28·0	3	1	1
Cawdor	*Nairn*	57 31	3 57	250	...	...	...	...	...	...
Invergarry	*E. Inverness*	57 4	4 47	130?	...	...	...	...	...	...
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	...	...	...	...	...	...
Dunrobin Castle	*Sutherland*	57 59	3 56	14	68·0	10	36·0	3	0	...
Castletown	*Caithness*	58 35	3 23	100	77·0	10	27·0	21	1	1
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	74·5	22	42·5	4	0	...
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	71·5	21	35·0	4	0	...
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	70·0	8	36·0	3	0	...
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	71·0	9	32·0	3	1	3
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	71·2	10	38·7	4	0	0
Ballinasloe	*Galway*	53 20	8 15	160	...	...	...	...	...	...
Clifden (Kylemore House)	,,	53 32	9 52	105	...	...	...	...	...	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	...	...	...	...	...	...
Seaforde	*Down*	54 19	5 50	180	70·0	20	38·0	3	0	1
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	...	...	...	...	...	...
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	...	...	...	...	...	...

† and 20, 26, 27, 28.

RAINFALL FOR SEPTEMBER, 1907.

RAINFALL OF MONTH.							RAINFALL FROM JAN. 1.					
Aver. 1870-99.	1907.	Diff. from Av.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99.	1907.	Diff. from Aver.	% of Av	Mean Annual 1870-1899.	STATION.
in.	in.	in.		in.	Date.		in.	in.	in.		in.	
2·29	·62	—1·67	27	·16	4	8	17·74	14·56	— 3·18	82	25·16	Camden Square
2·62	·42	—2·20	16	·14	3, 4	6	18·80	13·71	— 5·11	73	28·36	Tenterden
2·58	·46	—2·12	18	·11	3	6	20·41	14·45	— 5·96	71	29·93	West Dean
2·38	·61	—1·77	26	·25	3	6	18·44	16·20	— 2·24	88	27·10	Hartley Wintney
2·26	·69	—1·57	31	·22	2	9	17·33	15·28	— 2·05	88	24·66	Hitchin
2·38	·90	—1·48	38	·50	2	6	18·96	15·74	— 3·22	83	26·75	Addington
2·49	·52	—1·97	21	·20	4	7	18·12	16·76	— 1·36	92	25·39	Westley
2·57	·43	—2·14	17	·14	4	5	17·58	16·43	— 1·15	94	25·40	Brundall
3·40	1·00	—2·40	30	·42	4	7	25·72	18·90	— 6·82	73	39·00	Winterbourne Stpltn
3·05	·94	—2·11	31	·48	26	9	23·74	16·84	— 6·90	71	35·00	Torquay
3·63	1·11	—2·52	30	·44	26	11	25·20	20·20	— 5·00	80	38·85	Polapit Tamar
2·89	·49	—2·40	17	·18	2	4	21·71	19·63	— 2·08	90	30·75	Bath
2·72	·71	—2·01	26	·29	2	5	21·28	18·51	— 2·77	87	29·85	Stroud
2·74	·72	—2·02	26	·19	4	7	22·95	21·98	— ·97	96	33·04	Wolstaston
2·71	·68	—2·03	25	·21	4	7	20·79	18·43	— 2·36	89	29·21	Coventry
2·30	·58	—1·72	25	·18	4	8	16·75	13·74	— 3·01	82	23·30	Boston
2·18	·51	—1·67	23	·17	4	8	17·81	14·03	— 3·78	79	24·70	Hodsock Priory
2·32	·75	—1·57	32	·28	4	7	18·85	19·91	+ 1·06	106	26·18	Derby
4·38	1·49	—2·89	34	·58	4	12	29·61	33·37	+ 3·76	113	42·43	Bolton
2·53	·84	—1·69	33	·35	2, 4	5	19·36	17·39	— 1·97	90	26·96	Ribston Hall
5·13	1·07	—4·06	21	·57	4	5	42·00	42·65	+ ·65	101	60·96	Arncliffe Vic.
2·40	·70	—1·70	29	·37	4	7	18·95	16·02	— 2·93	85	27·02	Hull
2·36	·64	—1·72	27	·33	4	7	19·76	16·64	— 3·12	84	27·99	Newcastle
12·76	2·03	—10·73	16	·86	1	8	90·72	83·14	— 7·58	92	132·68	Seathwaite
4·08	·81	—3·27	20	·23	3	8	29·31	24·16	— 5·15	82	42·81	Cardiff
4·21	1·40	—2·81	33	·47	4	5	31·62	26·88	— 4·74	85	47·88	Haverfordwest
4·20	1·13	—3·07	27	·39	4	5	30 66	31·50	+ ·84	103	45·41	Gogerddan
2·92	·22	—2·70	8	·10	4	5	20·57	16·43	— 4·14	80	30·98	Llandudno
3·71	·73	—2·98	20	·38	1	3	29 86	31·36	+ 1 50	105	43·43	Cargen
2·77	...	...	...	...	...	...	23·33	...	...	...	33·04	Riddell House
...	1·30	...	...	·51	2	9	...	20·98	...	...	..	Edinburgh
4·44	1·72	—2·72	39	·40	4	17	32·90	...	...	...	48·87	Girvan
3·34	1·25	—2·09	37	·36	4	13	25·43	27·68	+ 2·25	109	35·80	Glasgow
5·53	3·53	—2·00	64	1·30	1	11	39·64	43·79	+ 4·15	110	57·90	Tighnabruaich
5·47	1·79	—3·68	33	·65	12	17	38·53	37·54	— ·99	97	57·53	Quinish
2·55	1·15	—1·40	45	·40	2	9	20·75	21·25	+ ·50	102	28·95	Dundee
3·27	·96	—2·31	29		...	...	24·93	21·76	— 3·17	87	36·07	Braemar
3·04	1·21	—1·83	40	·45	4	10	22·97	20·60	— 2·37	90	33·01	Aberdeen
3·01	·70	—2·31	23	17	1	7	21·34	22·09	+ ·75	104	29·37	Cawdor
5·12	2·20	—2·92	43	·48	6	8	37·81	43·13	+ 5·32	114	56·00	Invergarry
8·28	4·02	—4·26	48	1·01	6	16	57·69	68·98	+11·29	112	86·50	Bendamph
2·71	1·04	—1·67	38	·38	1	10	21·63	24·85	+ 3·22	115	31 60	Dunrobin Castle
...	·68	...	...	·19	1	15	...	23·11	...	...	..	Castletown
4·67	1·71	—2·96	37	·74	26	11	39·57	27·41	—12·16	69	58·11	Killarney
3·08	1·38	—1·70	45	·45	26	8	27·08	23·01	— 4·07	85	39·30	Waterford
2·94	1·73	—1·21	59	·48	4	16	23·79	23·84	+ ·05	100	33·47	Hurdlestown
2·86	1·27	—1·59	44	·29	3, 4	9	25·05	24 24	— ·81	97	35·19	Abbey Leix
2·15	·55	—1·60	26	·26	3	7	19·68	17·13	— 2·55	87	27·75	Dublin
3·17	...	...	...	...	...	...	26·36	..	...	...	37·04	Ballinasloe
6·72	3·29	—3·43	49	1·30	1	9	55·06	46·77	— 8·29	85	80·23	Kylemore House
4·12	1·81	—2·31	44	·52	1	17	34·02	34·14	+ ·12	100	50·50	Enniscoe
3·37	1·41	—1·96	42	·68	1	6	27·21	27·62	+ ·41	101	38·61	Seaforde
3·77	...	...	...	...	...	...	28·25	...	...	...	41·20	Londonderry
3·55	...	...	...	..	...	...	26·83	..	...	...	37·85	Omagh

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1907.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain. inches
II.	Abinger Hall	·87	XI.	Rhayader, Tyrmynydd	·91
,,	Ramsgate	·41	,,	Lake Vyrnwy	1·03
,,	Hailsham	·71	,,	Llangyhanfal, Plâs Draw	·69
,,	Crowborough, Uckfield Lodge	·95	,,	Criccieth, Talarvor	·53
,,	Totland Bay, Aston House	·93	,,	Llanberis, Pen-y-pass	2·05
,,	Emsworth, Redlands	·58	,,	Lligwy	53
,,	Alton, Ashdell	·61	,,	Douglas, Woodville	1·00
,,	Newbury, Welford Park	·81	XII.	Stoneykirk, Ardwell House	1·37
III.	Harrow Weald, Hill House.	·73	,,	Dalry, The Old Garroch	1·06
,,	Oxford, Magdalen College	·63	,,	Langholm, Drove Road	1·05
,,	Bloxham Grove	·80	,,	Moniaive, Maxwelton House	1·05
,,	Pitsford, Sedgebrook	·66	XIII.	N. Esk Reservoir [Penicuick]	1·45
,,	Huntingdon, Brampton	·71	XIV.	Maybole, Knockdon Farm	·80
,,	Wisbech, Bank House	·54	XV.	Campbeltown, Witchburn	1·65
IV.	Southend Water Works	·34	,,	Inveraray, Newtown	2·88
,,	Colchester, Lexden	·77	,,	Ballachulish House	3·15
,,	Newport, The Vicarage	·43	,,	Islay, Eallabus	2·61
,,	Rendlesham	·76	XVI.	Dollar Academy	2·02
,,	Swaffham	·57	,,	Loch Leven Sluice	1·33
,,	Blakeney	·62	,,	Balquhidder, Stronvar	1·91
V.	Bishops Cannings	·73	,,	Perth, Pitcullen House	·84
,,	Ashburton, Druid House	1·32	,,	Coupar Angus Station	·76
,,	Okehampton, Oaklands	1·02	,,	Blair Atholl	1·13
,,	Hartland Abbey	1·02	,,	Montrose, Sunnyside Asylum	1·05
,,	Lynmouth, Rock House	·84	XVII.	Alford, Lynturk Manse	1·16
,,	Probus, Lamellyn	2·25	,,	Keith Station	1·05
,,	Wellington, The Avenue	...	XVIII.	N. Uist, Lochmaddy	2·41
,,	North Cadbury Rectory	·65	,,	Alvey Manse	·86
VI.	Clifton, Pembroke Road	·62	,,	Loch Ness, Drumnadrochit.	·66
,,	Ross, The Graig	·57	,,	Glencarron Lodge	3·01
,,	Shifnal, Hatton Grange	1·24	,,	Fearn, Lower Pitkerrie	·75
,,	Cheadle, The Heath House.	..	XIX.	Invershin	·88
,,	Blockley, Upton Wold	·64	,,	Altnaharra	·93
,,	Worcester, Boughton Park.	·47	,,	Bettyhill	·81
VII.	Market Overton	1·86	XX.	Dunmanway, The Rectory	2·36
,,	Market Rasen	·51	,,	Cork	2·22
,,	Bawtry, Hesley Hall	·42	,,	Darrynane Abbey	2·20
VIII.	Neston, Hinderton Lodge	·45	,,	Glenam [Clonmel]	1·27
,,	Southport, Hesketh Park	·75	,,	Ballingarry, Gurteen	1·26
,,	Chatburn, Middlewood	1·17	,,	Miltown Malbay	3·16
,,	Cartmel, Flookburgh	·79	XXI.	Gorey, Courtown House	1·39
IX.	Langsett Moor, Up. Midhope	·78	,,	Moynalty, Westland	1·43
,,	Scarborough, Scalby	·53	,,	Athlone, Twyford	1·63
,,	Ingleby Greenhow	·57	,,	Mullingar, Belvedere	·86
,,	Mickleton	·29	XXII.	Woodlawn	1·64
X.	Bardon Mill, Beltingham	·41	,,	Westport, Murrisk Abbey	...
,,	Ewesley, Fallowlees	·37	,,	Collooney, Markree Obsy	1·76
,,	Ilderton, Lilburn Cottage	·38	,,	Mohill	1·87
,,	Keswick, York Bank	·56	XXIII.	Enniskillen, Portora	1·19
XI.	Llanfrechfa Grange	·92	,,	Warrenpoint, Summer Hill.	1·07
,,	Treherbert, Tyn-y-waun	2·32	,,	Banbridge, Milltown	·99
,,	Carmarthen, The Friary	·90	,,	Belfast, Springfield	1·37
,,	Castle Malgwyn [Llechryd].	·92	,,	Bushmills, Dundarave	1·55
,,	Plynlimon	1·60	,,	Stewartstown, The Square	·80
,,	Crickhowell, Ffordlas	1·20	,,	Killybegs	2·55
,,	New Radnor, Ednol	·88	,,	Horn Head	1·43

METEOROLOGICAL NOTES ON SEPTEMBER, 1907.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

LONDON, CAMDEN SQUARE.—After the first week, which was somewhat unsettled, occurred the finest spell of the summer, with warm sunny days, and, except on 25th, no R from 7th to 29th. The mean temp. was 58°·5, or 0°·8 above the average. Duration of sunshine 143·9* hours, and of R 12·2 hours.

TENTERDEN.—Dry, warm, and genenally sunny after 6th. The R was the least since 1865. Duration of sunshine 197 † hours.

CROWBOROUGH.—Splendid weather from 7th, with considerable sunshine, and only ·12 in. of R. The total fall was 1·96 in. below the average of 36 years. Mean temp. 58°·5, or 1°·7 above the average.

BURY ST. EDMUNDS.—The most delightful month of the year, warm, with much sunshine, little wind, and 22 days in succession without R. Splendid harvest weather.

TORQUAY.—Duration of sunshine 172·0* hours, or 4·7 above the average. Mean temp. 59°·7, or 1°·4 above the average.

CLIFTON.—Fine and dry, with much sunshine, and absolute drought from 6th to 30th. The driest September since 1865.

BOLTON.—Duration of sunshine 84·4* hours, or 3·4 below the average, owing to frequent heavy mists. Mean temp. 55°·4, or 1°·4 above the average. No R fell from 5th to the end.

SOUTHPORT.—The driest September in 36 years' record, the fall being 2·45 in. below the average of 35 years. Duration of sunshine 128* hours, or 15 hours below the average, largely owing to haze; duration of R 12·3 hours.

CARMARTHEN.—Remarkably fine and bright, with abundant sunshine, and no R from 8th to 29th, inclusive. Partridges as a rule were scarce owing to the wet June, but pheasants seemed more promising. Corn and potatoes were well harvested.

HAVERFORDWEST.—No R from 7th to the end. Duration of sunshine 175·2* hours.

DOUGLAS.—The outlook at the beginning seemed hopeless, and the first five days were a prolongation of the lamentable weather of the previous three months, but there was a wonderful and quite unlooked for change on 6th, and from this date until 29th was an unbroken spell of magnificent weather, warm, sunny, calm, and very dry, to which gardens responded in a remarkable way.

DUMFRIES.—The R has been less in September twice only in 48 years, but although R was absent the weather was unfavourable for harvest operations, heavy dews and absence of wind preventing drying of stooks. Frost on 4th caused immense damage in gardens and to potatoes.

COUPAR ANGUS.—R 38 per cent. of the average, and mean temp. 53°·8, or 1°·7 above the average. The month opened with slight frosts, followed by calm and bright sunny days.

ABERDEEN.—Remarkably fine, bright and warm. The cereal crops which at the end of August were quite green ripened fast, and harvesting was general by the end of September.

DRUMNADROCHIT.—R 1·98 in., and rain days 6, below the average of 21 years. Unusually grand aurora on 10th.

BALLINGARRY.—A lovely month from 5th till 25th, with several hot days and no R. Harvest was begun and nearly finished in this period.

MILTOWN MALBAY.—Heavy R in the first and last weeks, but the middle was fair for harvesting, and the temp. was high throughout.

DUBLIN.—Opening with a broken and rainy spell the month proved fine, warm and genial, with absolute drought from 15th. Mean temp. 57°·8, or 1°·9 above the average of 35 years.

MARKREE.—With the exception of the first week, which was very wet, it was unusually fine, dry and mild. The duration of sunshine was small owing to fog.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, April, 1907.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Max. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	73·4	24	30·8	19	56·2	40·0	41·1	81	120·7	27·6	3·22	18	...
Malta	75·2	28	49·8	6	62·0	53·3	49·2	74	139·2	...	1·29	8	5·0
Lagos	91·0	30	71·0	1	87·8	76·6	75·2	75	161·0	70·0	6·07	9	7·7
Cape Town	84·4	3	48·4	20	71·2	55·2	53·2	73	—	—	1·94	8	5·2
Durban, Natal ...	84·2	28	57·6	23, 26	77·4	62·2	...	...	143·2	...	9·39	19	5·0
Johannesburg	72·6	9	43·2	26	64·6	49·3	50·4	84	149·9	37·5	2·91	12	4·5
Mauritius	84·4	15	61·8	29	81·5	69·9	68·5	80	144·3	55·0	8·51	17	6·9
Calcutta...	103·3	25	67·2	2	93·4	73·9	70·3	69	157·7	61·2	1·25	5	5·3
Bombay...	92·5	2	76·0	4	89·7	78·6	72·6	71	141·0	69·9	·06	3	4·2
Madras	97·4	30	71·6	12	92·4	76·6	74·4	78	147·0	69·6	·12	2	3·4
Kodaikanal	72·4	24	48·1	4	67·3	52·2	50·4	77	141·4	37·2	6·26	16	5·4
Colombo, Ceylon ...	91·4	9	71·4	10	89·5	75·4	73·4	75	155·8	69·8	6·16	16	4·6
Hongkong	81·7	13	53·9	1	72·9	65·7	64·8	84	136·7	...	11·76	16	8·6
Melbourne	90·0	4	43·0	3	65·8	50·6	46·5	69	141·1	32·0	2·38	14	7·7
Adelaide	92·4	4	45·0	17	69·8	52·5	48·9	66	142·0	37·8	2 26	16	6·1
Coolgardie	96·2	3	45·0	18, 28	75·8	54·0	43·1	51	164·3	39·0	·00	0	1·8
Sydney	81·9	2	49·1	27	72·0	57·0	52·4	71·4	116·9	39·2	1·50	15	3·6
Wellington	72·5	16	42·4	30	63·5	53·3	50·5	76	118·0	34·0	2·73	16	6·7
Auckland	75·0	9	45·0	30	69·3	57·3	54·6	74	130·0	41·0	2·94	13	5·3
Jamaica, Negril Point.	88·2	16	65·2	4	84·2	69·8	67·6	71	...	...	1·29	6	...
Trinidad	93·0	21	65·0	several	88·1	68·3	70·8	79	159·0	60·0	·09	1	...
Grenada	86·8	12	71·0	9	85·0	73·4	66·4	65	149·2	...	1·29	10	3·3
Toronto	70·0	29	17·6	2	..	...	...	...	...	...	2·09	11	0·6
Fredericton	68·0	30	11·0	8	...	...	...	66	...	...	4·89	8	0·6
St. John's, N.B. ...	52·3	28	13·5	7	...	...	...	...	...	...	4·51	16	0·7
Victoria, B.C.	67·2	21	32·2	28	...	...	...	...	...	...	1·39	8	0·5
Dawson	61·0	27	-29·5	1	...	...	...	..	...	...	·23	8	0·4

MALTA.—Mean temp. of air 58°·2. Mean hourly velocity of wind 12·4 miles.

Natal.—Rainfall 6·50 in. above the average and the heaviest fall in the month of April for 34 years.

Johannesburg.—Bright sunshine 195·6 hours, or 57 per cent. of the possible amount.

Mauritius.—Mean temp. of air equal to, dew point 0°·3, and relative humidity 1·2 per cent. below, and R 3·50 in. above, averages.

MADRAS.—Bright sunshine 255·3 hours. TSS on 2 days.

KODAIKANAL.—Bright sunshine 201 hours.

COLOMBO.—Mean temp. of air 82°·3 or 0°·3 below, of dew point 1°·1 below, and R 4·50 in. below, averages. Mean hourly velocity of wind 5·6 miles per hour.

HONGKONG.—Mean temp. of air 69°·2. Bright sunshine 78·3 hours. R 6·2 in. above, and sunshine 30·8 hours below, averages. Mean hourly velocity of wind 13·5 miles.

Adelaide.—Mean temp. of air 2°·9 below, and R ·41 in. above, averages.

Sydney.—Mean temp. of air 0°·1 below, and R 3·95 in. below, averages.

Wellington.—Mean temp. of air 1°·8 above, and R ·04 in. below averages. Bright sunshine 153·6 hours.

TRINIDAD.—R 2·03 in. below 43 years' average.